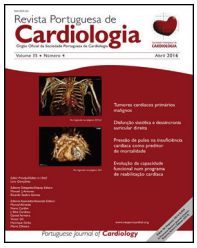
Revista Portuguesa de Cardiologia 2020;**39(12)**:729.e1–729.e4

Portuguese Society of CARDIOLOGY

Revista Portuguesa de
Cardiologia
Portuguese Journal of ***Cardiology***
www.revportcardiol.org



CASE REPORT

Inappropriate tachycardia at rest as a consequence of atrial preference pacing algorithm

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Received 3 June 2019; accepted 5 May 2020

KEYWORDS
Preferential headset pacing;
Permanent pacemaker;
Ear tachyarrhythmias

Abstract A 34-year-old female with a past medical history of sick sinus syndrome which requiring placement of single chamber (atrial) permanent pacemaker (Medtronic, Minneapolis, MN, USA). One year after pacemaker implantation, the patient reported exercise intolerance and palpitation at rest. Device interrogation during clinic visit revealed 99% atrial pacing and high atrial rate episodes. What is the mechanism for high atrial rate episodes? Atrial preference pacing (algorithm is a promising method for preventing atrial tachyarrhythmia in patients with an implanted pacemaker. However, instead of using nominal search interval settings, which may not benefit patients, we should individually tailor the programming, identifying the most effective search interval and be aware of possible pro-arrhythmic effects.

PALAVRAS-CHAVE
Pacing auricular preferencial;
Pacemaker permanente;
Taquiarritmias auriculares

Taquicardia inapropriada em repouso secundária a algoritmo de *pacing* auricular preferencial

Resumo Mulher de 34 anos com história de doença do nódulo sinusal com implantação de *pacemaker* definitivo de câmara única (auricular) (Medtronic, Minneapolis, EUA). Um ano após a implantação do *pacemaker*, inicia queixas de intolerância ao esforço e palpitações em repouso. A análise ao equipamento durante a visita clínica revelou 99% de *pacing* auricular e episódios de frequência auricular rápida. Qual o mecanismo destes ritmos auriculares rápidos? O algoritmo de *pacing* auricular preferencial (EAP) é um método promissor para a prevenção da taquiarritmias auriculares em doentes com *pacemaker*. No entanto, em vez de aceitar as definições nominais

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dos intervalos de pesquisa destes algoritmos, que poderão não beneficiar os doentes, devemos individualizar a programação, identificando o intervalo de pesquisa mais eficaz e estando atentos a possíveis efeitos pró-arrítmicos.

Case report

A 34-year-old female with a past medical history of atrial tachycardia ablations (five different foci were ablated in two different procedures) and sick sinus syndrome possibly due to secondary injury during ablation procedures, which required placement of a single chamber (atrial) permanent pacemaker (Medtronic, Minneapolis, MN, USA) at a different hospital. One year after pacemaker implantation, the patient reported exercise intolerance and palpitation at rest. Device was programed with a lower rate of 70 bpm, however on her resting electrocardiogram, rhythm was atrial paced, ventricular sensed with a heart rate of 94 bpm. Device interrogation (Figure 1) during clinic visit revealed 99% atrial pacing and high atrial rate episodes (EGM_1 and EGM_2; Figure 2 and Figure 3). What is the mechanism for high atrial rate episodes which is causing exercise intolerance and palpitation at rest?

Discussion

After careful examination of device interrogation (Figure 1), which shows that the atrial preference pacing (APP) feature was turned on with an internal decrement of 100 ms, which is nominally off. This feature was designed to suppress atrial arrhythmias, but in this case, interrogation of electrograms revealed that high atrial rate episodes as a consequence of APP were causing palpitation at rest and exercise (EGM_1 and EGM_2; Figure 2).

Atrial tachycardia is not a life-threatening arrhythmia and usually patients present with symptoms such as shortness of breath and palpitation, etc. In patients with permanent pacemakers, some studies have shown that atrial pacing reduces the incidence of atrial tachyarrhythmias.[1–3] It has been described that an increased number of premature atrial contractions, by causing a dispersion of atrial refractoriness and conduction velocities, may play a role in initiation of atrial tachyarrhythmias.[4–7] The APP algorithm developed by Medtronic Inc. (Minneapolis, MN, USA) allows the pacemaker to maintain the pacing rates slightly higher than the sinus rates and was designed to achieve a high percentage of atrial pacing to prevent atrial ectopic activity and premature atrial contractions. Several studies have assessed the efficacy of the APP algorithm but did not reveal consistent results and in some patients, APP activation is associated with a reduction in atrial tachyarrhythmias, but not in others not.[8,9] In another study, APP off with APP on

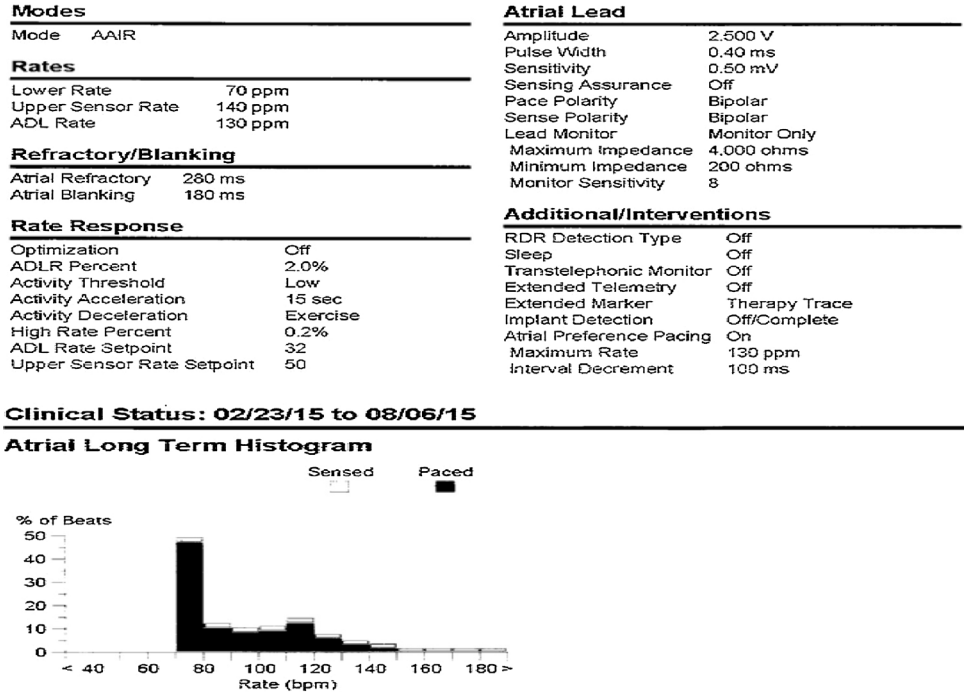

Figure 1 Device interrogation, AAIR 70/140 bpm, atrial pacing 99%, atrial pacing preference on with an internal decrement of 100 ms.

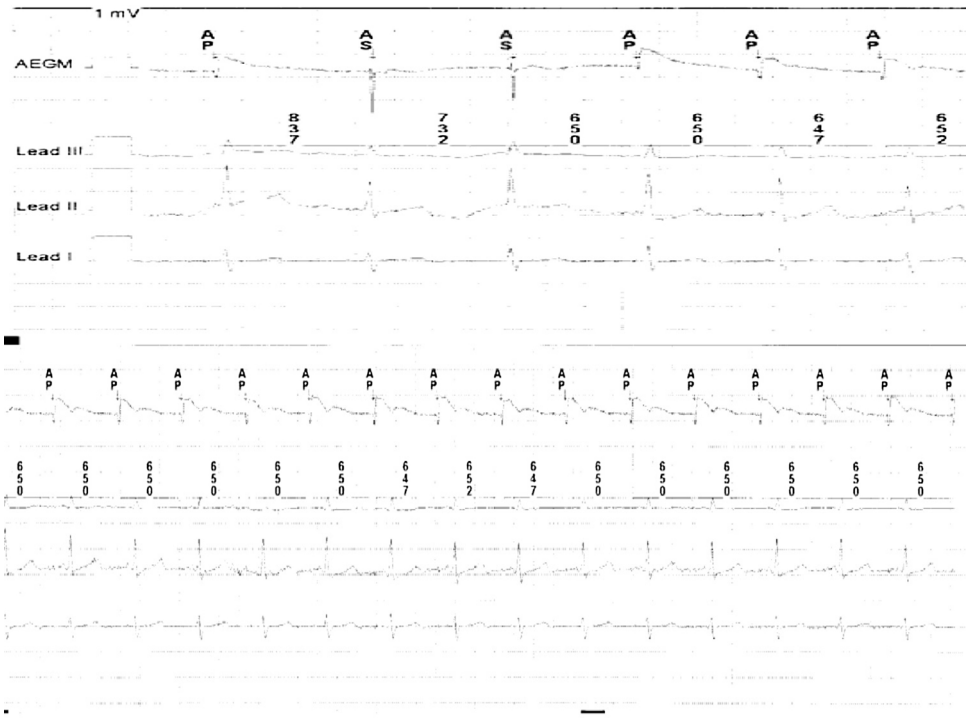

Figure 2 EGM1. During searching period device detected a PAC at CL of 732 msec and initiate APP.

with three different search interval settings was compared and demonstrated that APP search interval setting should be tailored to the individual to obtain the greatest benefit from the algorithm to suppress atrial tachyarrhythmias instead of using nominal numbers.[9] A case report also showed the onset of a life-threatening monomorphic ventricular tachycardia due to the APP algorithm.[10] In our case, high atrial rate episodes, APP, as a consequence of APP were causing palpitation at rest and exercise intolerance. Symptoms were resolved by turning the APP algorithm off.

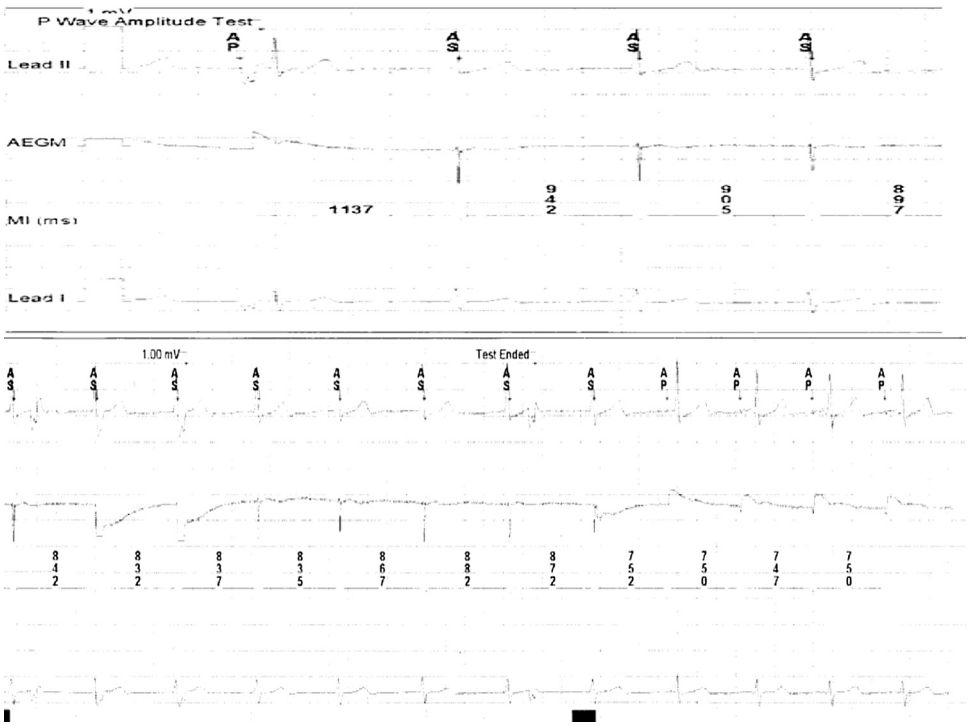

Figure 3 EGM2 after P wave amplitude test device detected a PAC at CL of 752 ms and initiate APP.

Conclusion

APP algorithm is a promising method for preventing atrial tachyarrhythmia in patients with an implanted pacemaker. However, instead of using nominal search interval settings, which may not benefit patients, we should individually tailor the programming, identifying the most effective search interval and also be aware of any possible pro-arrhythmic effects such as, high atrial rates, life-threatening arrhythmia ventricular arrhythmias, etc.

Conflicts of interest

The author has no conflicts of interest to declare.

References

1. Andersen HR, Nielsen JC, Thomsen PE, et al. Long-term follow-up of patients from a randomized trial of atrial versus ventricular pacing for sick-sinus syndrome. Lancet. 1997;350:1210–6.
2. Connolly SJ, Kerr CR, Gent M, et al. Effects of physiologic pacing versus ventricular pacing on the risk of stroke and death due to cardiovascular causes Canadian Trial of Physiologic Pacing Investigators. N Engl J Med. 2000;342:1385–91.
3. Lamas GA, Lee KL, Sweeney MO, et al. Ventricular pacing or dual-chamber pacing for sinus-node dysfunction. N Engl J Med. 2002;346:1854–62.
4. Dimmer C, Szili-Torok T, Tavernier R, et al. Initiating mechanisms of paroxysmal atrial fibrillation. Europace. 2003;5:1–9.
5. Hnatkova K, Waktare JE, Murgatroyd FD, et al. Analysis of the cardiac rhythm preceding episodes of paroxysmal atrial fibrillation. Am Heart J. 1998;135:1010–9.
6. Dimmer C, Tavernier R, Gjorgov N, et al. Variations of autonomic tone preceding onset of atrial fibrillation after coronary artery bypass grafting. Am J Cardiol. 1998;82:22–5.
7. Wang J, Liu L, Feng J, et al. Regional and functional factors determining induction and maintenance of atrial fibrillation in dogs. Am J Physiol. 1996;271:H148–58.
8. Ricci R, Santini M, Puglisi A, et al. Impact of consistent atrial pacing algorithm on premature atrial complexe number and paroxysmal atrial fibrillation recurrences in brady-tachy syndrome: a randomized prospective cross over study. J Interv Card Electrophysiol. 2001;5:33–44.
9. Ogawa H, Ishikawa T, Matsushita K, et al. Effects of right atrial pacing preference in prevention of paroxysmal atrial fibrillation Atrial Pacing Preference Study (APP Study). Circ J. 2008;72:700–4.
10. Martinez Sanchez J, Garcia Alberola A, Sanchez Munoz J, et al. ICD proarrhythmia as a consequence of an interaction with an algorithm to prevent atrial arrhythmias. PACE. 2009;32:1096–8.